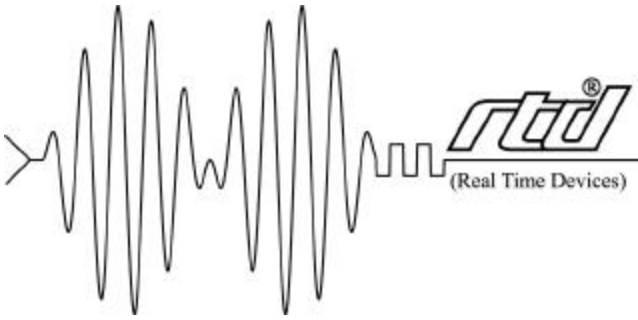
VPWR104HR Embedded PC/104 Power supply module

User's Manual



RTD Embedded Technologies, Inc.
"Accessing the Analog World"®

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VPWR104HR
Power supply module
User's Manual

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Chapter 2 INTRODUCTION

This user's manual describes the operation of the VPWR104HR PC/104 high power density automotive input range power-supply unit

Features

Some of the key features of the VPWR104HR include:

1. Wide input voltage range 8-40V DC
2. Series DC/DC converters for computer power and peripheral power
3. 80% efficient 50W output power ***with adequate cooling***,
4. Power output options include: VPWR104HR +5V, +12V, -12V
5. 2 Status LED's
6. Standard floppy power output connector on all versions (J2)
7. Fully PC/104 compliant
8. Extended Operating Temperature (-40 to +85 C)

The following paragraphs briefly describe the major features of the VPWR104HR. A more detailed discussion is included in Chapter 3 (Hardware description) The board installation is described in Chapter 2 (Board Installation).

Power supply units

The VPWR104HR automotive input power supply unit offers a complete reliable power subsystem for your sophisticated computer and its peripherals. To improve reliability in error conditions, the VPWR104HR is designed using a 50 Watt +5V converter cascaded into a 6 Watt –12V and a 24 Watt +12V converter.

The main +5V computer power supply is designed using a "Buck" connected switching regulator providing high output current (10A) with a high efficiency (>80%) under all conditions.

Board Options

The VPWR104HR is available in the configuration as set out below:

Option 1	**VPWR104HR-50W**	+5V, +12V, -12V
Option 2	**IDAN-VPWR104HR-50W**	+5V, +12V, -12V

Mechanical description

The VPWR104HR is designed on a PC/104 form factor. An easy mechanical interface to both PC/104 and EUROCARD systems can be achieved. Stack your VPWR104HR directly on a PC/104 compatible computer using the onboard mounting holes. Care must be taken to ensure adequate heat dissipation from the onboard heat sink in high output power configurations.

Connector description

The standard power connections are made using "cable plug" type terminal blocks. This enables removing connections from the board without opening the cables from the terminal blocks. A 4-pole "floppy type" connector is also available for easy wiring to PC peripherals. In the IDAN-VPWR104HR the connections are implemented using standard terminal blocks.

What comes with your board

Your VPWR104HR package contains the following items:

1. VPWR104HR board
2. Mating connectors for the supported power connections
3. User's manual

If any item is missing or damaged, please call Real Time Devices Inc. customer service department at the following number: (814) 234-8087.

Using this manual

This manual is intended to help you install your new VPWR104HR module and get it working quickly, while also providing enough detail about the board and it's functions so that you can enjoy full use of it's features even in the most demanding applications.

When you need help

This manual will provide you with enough information to fully utilize all the features on this board. If you have any problems installing or using this board, contact our Technical Support Department (814) 234-8087 during business hours. Alternatively, send a FAX to (814) 234-5218 or Email to sales@rtd.com. When sending a FAX or Email request please include the following information: Your company's name and address, your name, your telephone number, and a brief description of the problem.

Chapter 3 BOARD INSTALLATION

The VPWR104HR embedded power supply module is very easy to connect to your industrial or automotive control system. Direct interface to PC/104 systems as well as EUROCARD boards is achieved. This chapter tells you step-by-step how to install your VPWR104HR into your system.

Board Installation

Keep your board in its antistatic bag until you are ready to install it to your system! When removing it from the bag, hold the board at the edges and do not touch the components or connectors. Please handle the board in an antistatic environment and use a **grounded** workbench for testing and handling of your hardware. Before installing the board in your computer, check the power cabling. Failure to do so may cause the power supply unit to malfunction or even cause permanent damage.

General installation guidelines:

- Touch the grounded metal housing of your computer to discharge any antistatic buildup and then remove the board from its antistatic bag. Use a grounding wrist strap if it is available.
- Hold the board by the edges and install it in an enclosure or place it on the table on an antistatic surface.
- Install your board in your system, and wire the power supply correctly.
- Failure to do so may cause the power supply unit to malfunction or even cause permanent damage to the device.
- Use wire that can pass 9 Amps or more current as the input.
- Do not use clip leads or alligator clips on the inputs or the outputs. These devices make a poor contact.
- Check all wiring connections once and then once more again.
- Check the input power to the board is in the range of 8 to 40V DC before connecting it.
- Apply power to your VPWR104HR, and make sure the diagnostic LEDS indicate operation.
- Once again check the input power to the board is in the range of 8 to 40V DC.
- Disconnect power.
- Apply the load (PC104 stack or DC load)
- Again Apply power to your VPWR104HR, and make sure the diagnostic LEDS indicate operation.
- One last time, check the input power to the board is in the range of 8 to 40V DC.

Installation integrated with a PC/104 module stack:

- Secure the four PC/104 installation holes with standoffs.
- Connect the board to the power supplies using the power interface connectors.

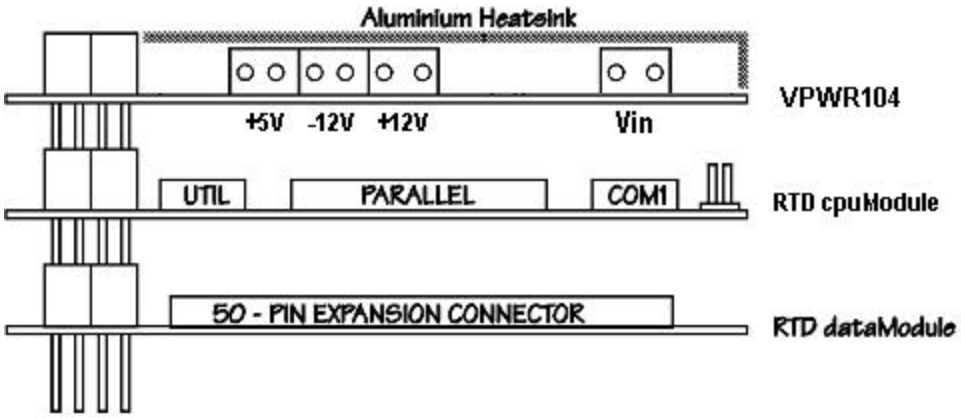

Fig. 1-1: VPWR104HR integrated in a RTD PC/104 cpuModule stack

Note:	For best cooling performance, install your VPWR104HR at the top of your PC/104 system and make sure adequate cooling is provided. You may increase airflow with the EFAN104 fan module from Real Time Devices.

3U rack or enclosure installation with a EUROCARD CPU and VPWR104HR.

The PC/104 system can easily be inserted into a 19" rack installation using the CPU as a "form factor adapter". Assemble your PC/104 data modules on a RTD single board EUROCARD computer and install the system in a 19" enclosure.

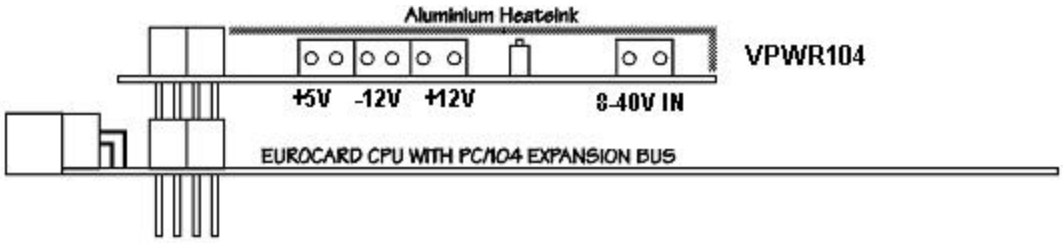

Fig. 1-2: 19" Eurocard rack installation with an VPWR104HR and an EUROCARD cpuModule computer

External Power Connections

The illustration 1-3 below indicates the power connections of the VPWR104HR board.

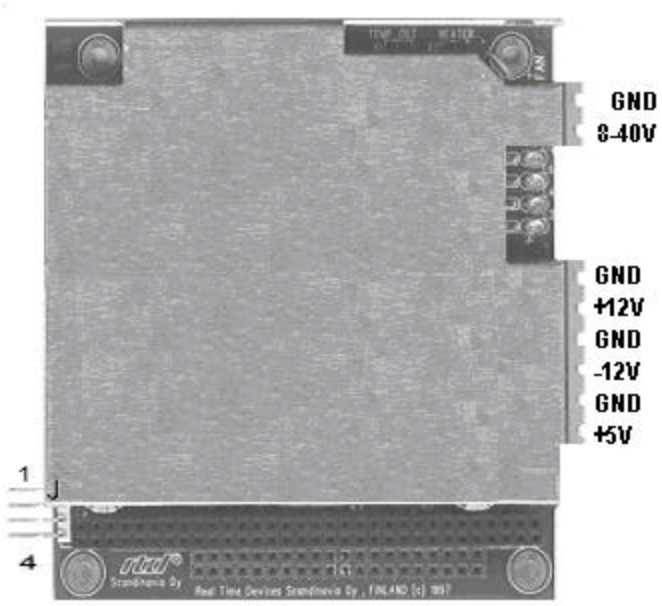

Fig. 1-3 VPWR104HR power supply power connections

Connector descriptions:

- ***J1***: Raw input power to the VPWR104HR. Input voltage range is 8-40V DC.
- Note: The input power of the module may be up to 60 W, this will require a cable wire diameter of 1,5 to 2,0 sq. mm. Make sure this input wire is kept as short as possible to reduce voltage drops and generated noise. Remember that the VPWR104HR will take up to 2x the normal current at startup. In case your power source can not provide this power (current) startup failure may occur.
- **J2**: Computer +5V supply, this power is also connected to the PC/104 bus.
- **J4**: +12V output for peripherals
- **J11**: -12V output for peripherals
- **J3**: "Floppy type" power connector Pin#1 = 5V, Pin#2,3 = GND, Pin#4 = +12V

Outputs J4, J11 are from the peripheral converter.

Chapter 4 HARDWARE DESCRIPTION

This chapter describes the major features of the VPWR104HR, which are the following:

- Main +5V converter for computer
- +-12V converter for peripherals
- The functionality of the LED's.
- Fuses and protection

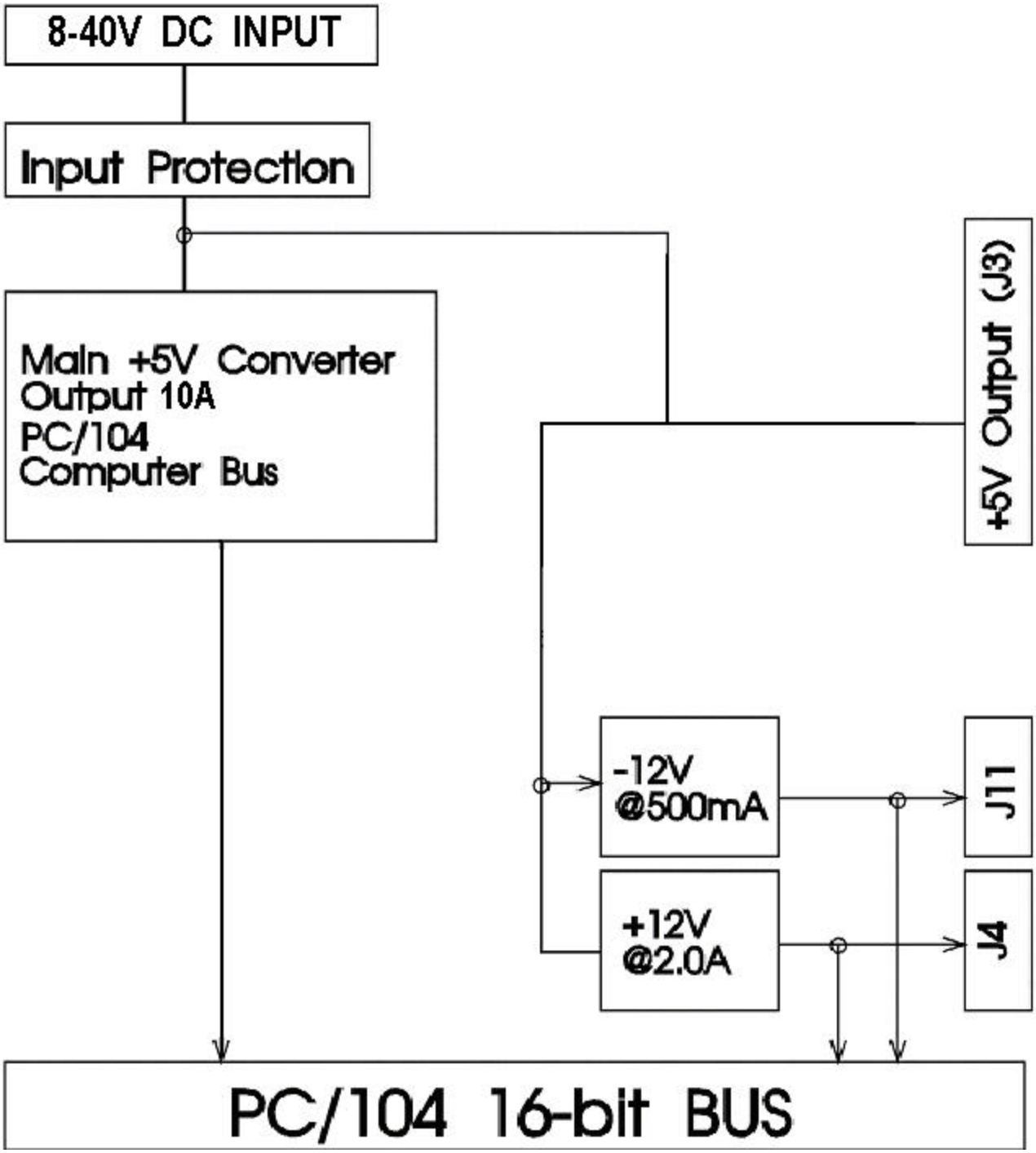

Fig. 2-1 Block diagram of the VPWR104HR

Main +5V converter for computer

The main +5V output is implemented with a Step-down PWM, switch-mode DC-DC regulator. The output current of this unit is 10A. This converter has excellent dynamic and transient response capabilities making it ideal for high-speed computer power supplies. The output current is internally limited against over current and short circuit faults. The toroid-type inductor ensures high power density and low radiated noise.

The input of this converter is protected with dual fast transient absorber and a schottky diode. These devices are necessary to protect the input in automotive installations against overvoltage spikes and reverse voltage transients. These situations exist in vehicle systems that use electrically controlled hydraulic or pneumatic inductive valves. The main +5V converter feeds the PC/104 AT bus +5V pins with power. This power can be taken from the board from an external terminal block J2. (See previous section for location of J2.)

Remote On/Off Control

Header connector X1 near one of the PC/104 mounting holes is the remote ON/OFF selection switch. Closing this connection will disable the VPWR104HR and place the converter "OFF". In this condition the VPWR104HR will consume minimum power. This signal could be connected to the ignition key of an automobile or machine.

Secondary +-12V converter for peripherals

The peripheral +-12V step up converters generates power for peripheral devices such as EL- or TFT-panels, Hard drives, motors etc. The +12V output delivers 2.0A of current and the –12V output delivers 500 mA. The +12V supply also powers the PC/104 bus. The peripheral +-12V power at terminal block J4. (See previous section for location of J3/4.)

Onboard Status LED's

The VPWR104HR is equipped with 2 indicator LEDS. The function of the LEDS is described below (direction from PC/104 bus to board edge).

LED+5	Green. Indicates Computer +5V power converter is alive
LED+12	Green. Indicates Peripheral +12V converter is alive

Fuses and protection

To protect your power supply from extensive long-term shorts the +5V DC/DC converters have current fold-back. The +-12V DC/DC converters are current limited and will tolerate continuous short circuit condition if they do not become overheated due to high ambient temperature.

The +12V converter is current limited to 2A and the -12V converter is current limited to 500mA. Outputs of all the +5V and the +12V converter outputs are zener diode protected; the +5V outputs with 3W 5.1V diodes and the +12V output with +13V zener diodes. These diodes protect your system from error conditions.

Output Power Calculations

The maximum available power for the peripheral power supply can be estimated using the following conservative formula:

I1 = +12V output current
I2 = -12V output current
I3 = +5V output current
50Watts = ((I1/0.80 + I2/0.80)/0.8)*12V + (I3 *0.80)

Note: Even though the total output power figure of 10A @5V is not exceeded, you must remember not to overload an individual output! Care must be taken not to thermally overload the unit. The maximum specified output power may not be available if the ambient temperature rises, and in this case additional heat sinking or additional airflow may be necessary.

The absolute maximum long-term output figures are:

+12V -> 2.0A
-12V -> 500mA
+5V -> 10A

Application: Planar ICEBRITE panel interfacing

Planar ICEBRITE 640.480AM1 Power consumption Pmax = 24W
Ptyp = 11W

Connection to VPWR104HR: Connect Panel +5V +5V supply
Connect Panel +12V to Peripheral +12V supply

The input power of the panel may vary greatly depending on the output pattern.
The maximum power consumption occurs with 50/50 2 x 2-checker board test picture.

Application: External heater and fan interfacing

Figure 2-3 shows a system with a heater unit and an external cooling fan.

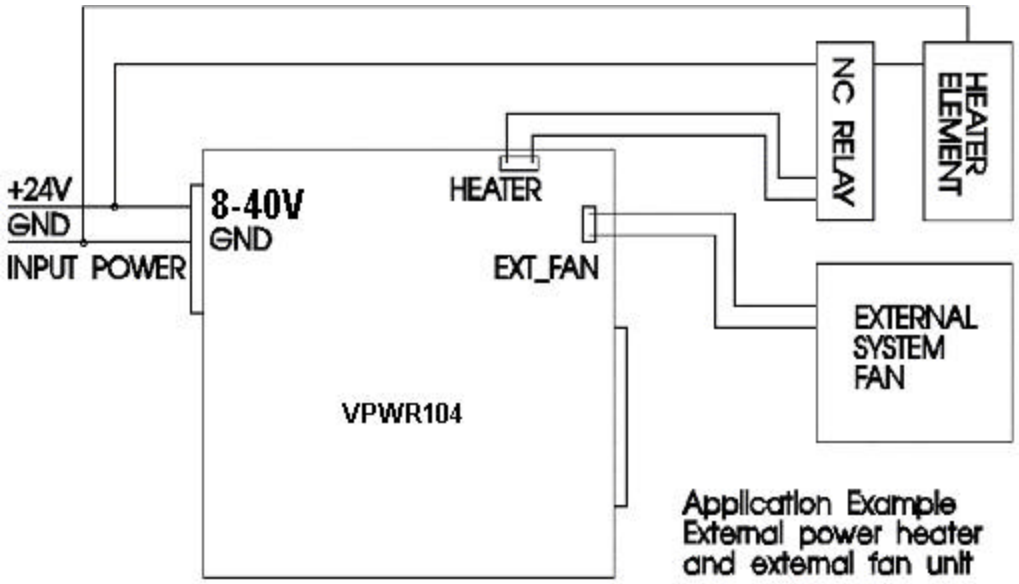

Fig. 2-3 System with heater unit and external system fan.

In this set up the external system fan is operated in parallel with the onboard fan unit .The trip point is adjusted with the "high" trimpot toward the middle of the board. The heater element derives its power from the raw power supply. This power is switched on and off by a relay (mechanical or solid state). Selection of the relay must be done according to the following criteria:

- Primary 12V operation
- Secondary contacts must withstand heater current Function of the relay must be "normally closed" i.e the secondary contacts are closed when primary inactive

Such relays include:

Siemens SPCO type relay (6A contact rating)
V23092-A112V Farnell code: 959-340
Siemens SPCO type relay (8A contact rating)
V23061-B100X-A601 Farnell code: 910-764
OMRON SPCO type relay (20A contact rating)
G8H-1C4T-R Farnell code: 959-157
OMRON SPCO type relay (35A contact rating)
G8J-1C7T-R Farnell code: 959-133

Application: Two level fan control

Figure 2.4 overleaf shows a system with two independently configured external fan units.

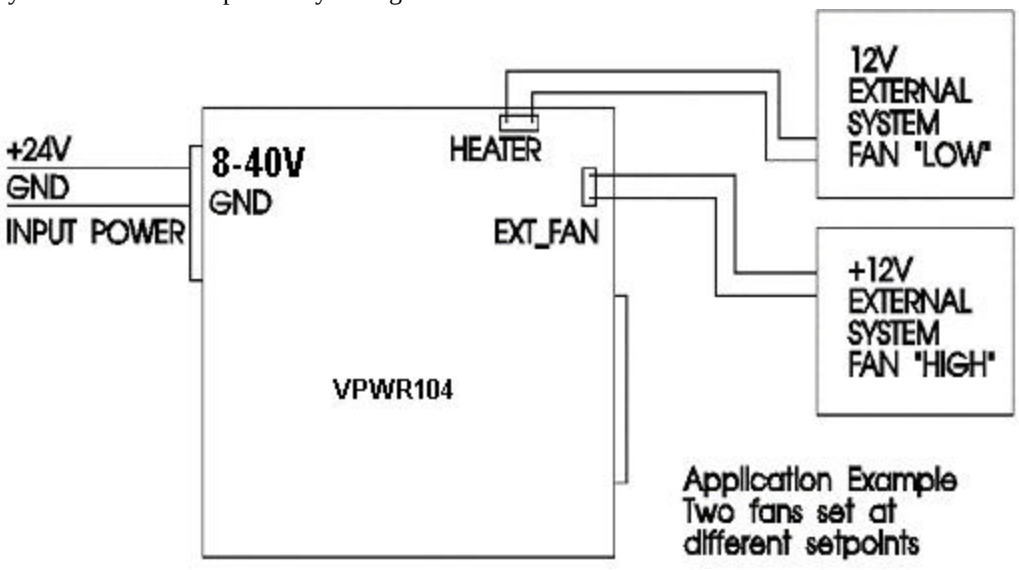

Fig. 2-4 Two level fan control

In this application it is possible to have two fans working in different temperature ranges as shown by the example below:

The "12V External system fan LOW" starts at a temperature of 40 degrees C if the temperature continues to rise to a level of 60 degrees C for example the "12V External system fan HIGH" will start. Now at temperature >60 C both units will work. This capability will free the hands of the system designer to implement flexible configurations for different environmental conditions.

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Chapter 5 VPWR104HR SPECIFICATIONS

Host Interface

16-bit PC/104 bus

Power supply specifications

Input voltage range (A high voltage variant is also available, please consult RTD)	8-40V DC Absolute maximum
Output Power (50W total)	+5V@ 10A - Computer +12V@ 2.0A (created from +5V) -12V@ 500mA (created from +5V)
5V efficiency	82%
Output voltage unloaded	Vnom +4.95V - +5.10V

Connectors

Power connectors	Phoenix Contact Combicon Series "mini-floppy connector"
Host bus (Optionally no bus connector)	AT PC/104 bus

Electromechanical

Operating temperature range	-40 to +85C
Heat sink material	Aluminum, 1 mm thick material

Chapter 6 RETURN POLICY AND WARRANTY

NOTE!	**You *must* have authorization from the factory in the form of an RMA# before returning *any* item for *any* reason!**

If you wish to return a product to the factory for service, please follow this procedure:

Provide the following:

- The board's complete name.
- The board's serial number.
- A detailed description of the board's behavior.

Read the Limited Warranty to familiarize yourself with our warranty policy.

Contact the factory for a Return Merchandise Authorization (RMA) number.

List the name of a contact person, familiar with technical details of the problem or situation, along with their phone and fax numbers, address, and e-mail address (if available).

List your shipping address!!

Indicate the shipping method you would like used to return the product to you.
We will not ship by next-day service without your pre-approval.

Carefully package the product, using proper anti-static packaging.

Write the RMA number in large (1") letters on the outside of the package.

Return the package to:

RTD Embedded Technologies, Inc.

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USA

Chapter 7 LIMITED WARRANTY

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During the one year warranty period, RTD Embedded Technologies will repair or replace, at its option, any defective products or parts at no additional charge, provided that the product is returned, shipping prepaid, to RTD Embedded Technologies. All replaced parts and products become the property of RTD Embedded Technologies. Before returning any product for repair, customers are required to contact the factory for an RMA number.

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